For the love of grain
Solutions for the grain industry
Sensors and Communication

siemens.com/sensors/food-beverage
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“Success and failure, victory and defeat, often depend in human life entirely on the timely and right use of the opportunities offered.”

-- Werner von Siemens, 1889

“It’s the opportunities and challenges the world offers that count for us.”

-- Peter Löscher, 2011

In the years between the autobiography of Siemens’ founding father and this address by Siemens AG President and CEO, much has changed. What has remained constant, however, is the world’s determination to overcome the challenges facing us every day. Siemens is continuously working to do just that: to drive innovation for the grain industry so that your work is made easier, safer, and more cost-effective.

Give us the opportunity and we will give you a solution.
Level Process protection
Flow
Weighing
Identification
Vision sensors
Gas analytics
Temperature
Solutions for a changing landscape

A successful grain merchant during the 1840s is considering expansion in the coming years. Recent years have been fruitful, but there are rumors of a new invention on the market: a grain elevator. Claims are that this elevator is able to unload more than 1,000 bushels each hour! Compare this to current operations where workers carry sacks of grain on their backs from wagons to waiting ships. Our grain merchant has seen firsthand the hazards of this process – everything from suffocating and explosive grain dust to the daily stresses on workers’ bodies. Will this new technology be able to increase the merchant’s profits as well as make a safer working environment for employees?

Over a century and a half later, mechanized equipment is now an essential part of the grain industry, from planting and growing to harvesting, handling, and milling grain. Your challenges are still the same as those of nineteenth century grain operators, though – how can you improve processes and cut costs while also increasing safety?

There’s no doubt about it: production inefficiencies and inventory inaccuracies caused by faulty or outdated technology are holes in your business’ pockets. Maximizing profit margins are essential in the grain industry, and you cannot afford waste – whether it is raw materials, machinery, or labor. To expand and maintain your competitive advantage, you need the right tools to ensure that production is sharp and running smoothly.

An even greater concern, however, is the safety of your workers. Why not use a reliable solids level transmitter instead of routinely sending employees to the top of silos? By keeping workers out of hazardous situations altogether, you can immediately reduce the chance of accidents and the consequences to your company.

Safety and profit growth are not incompatible, and Siemens range of process instrumentation and analytical devices delivers solutions to both of these challenges in the grain industry.

When you partner with Siemens, your returns will be:

• A full portfolio of products and solutions for each process step in the value chain

• A single concept for seamless integration of the entire company to master productivity, quality, and supply challenges

• Simplified inventory – fewer different components with highly efficient maintenance

• The assurance of a world-class brand delivering leading-edge automation technology

• People who understand the grain industry’s needs and can configure solutions to match your exact operating conditions
Growing trends in the grain industry

Promoting a culture of safety
Working with grain has the potential to be deadly, especially when grain is in motion. Similar to ‘quicksand,’ moving grain can bury a worker in seconds. In 2010, U.S. grain operators reported that fifty-one workers had been trapped in grain, more than in any year since Purdue University began collecting data on grain entrapments in 1978. Sadly, almost half of these entrapments led to fatalities.*

Increasing automation
To prevent deadly occurrences such as these, the grain industry is increasingly taking steps to reduce grain handling and storage hazards. Improving efficiency in grain facilities through automation is becoming a growing industry trend. A concern for safety is one driver behind automating operations, as a reduction in human interactions with grain decreases the occurrence of accidents.

Another reason for the push towards automation is that owners are constantly looking to increase production and reduce expenses while still producing a high quality product. A solution is to invest in automated processes in a facility. Many facilities have moved to complete automation of production, termed Totally Integrated Automation (TIA).

Refining inventory management
Tracking inventory in grain silos is a significant component of a successful grain operation. Managing raw materials and finished products is essential for keeping processes efficient and optimizing inventory ordering and shipments. By knowing where materials are located, companies can use these resources more effectively, decreasing human intervention and increasing efficiency. As well, checking bin levels on a regular basis requires substantial labor costs. To make inventory tracking faster and more streamlined, the industry is continually moving towards automated inventory management.

*United States Occupational Safety and Health Administration, 2011
The Siemens approach

- An emphasis on user-friendly products – for safer, faultless operation
- A high degree of product safety – through maximum process transparency
- Optimal resource efficiency – through innovative platform concepts
- More flexibility – for faster and safer production changeover
- Increased productivity – with optimal solutions for the operating phase

Customer benefits

- Fast commissioning, short ramp-up times
- Low total cost of ownership
- Quick return on investment
- Continuous process through innovative service and support concept
- Traceability to ensure manufacturing quality through completely integrated production
- Maximum compatibility and innovation providing you with confidence in the future
Grain handling
Process overview

From the hopper to waiting trucks or rail cars, grain makes its way through a series of processing stages in grain elevators and terminals. Siemens sensor systems and communication devices play important roles each step of the way.
Milling
Process overview

Before it can be used in everything from pastries to pasta, flour is milled to separate bran and germ from the endosperm. Instruments for level, weighing, flow, and process protection – to list a few – are crucial to your milling operations.

“All sorrows are less with bread.”
-- Miguel de Cervantes, 1547-1616
Grain is housed in silos through the complete value chain from the grower to the end product after the milling process. As instrumentation and the systems to collect data are now cost-effective with a satisfactory payback, the industry is moving to equip the complete value chain. Knowing levels throughout the facility is a definite benefit to optimizing operations.

**Grain handling**

After harvest, grain is transported to grain terminals where it is stored and then later distributed. At grain terminals, trucks unload grain into receiving hoppers, and conveyors move it towards bucket elevators. These grain elevators lift grain to the ‘headhouse.’ Once there, machinery cleans, dries, and blends grain before it is distributed into storage bins by a diverter (or tripper).

Grain and seeds such as wheat, corn, rice, oats, soybeans, and sorghum are shipped from the elevators to be used directly or manufactured into countless numbers of products.

**Milling**

To prepare grain such as wheat for end-product manufacturing, it must make its way through the milling process.

Once grain is received at the mill, it first needs to be cleansed to remove impurities. After this, rollers grind and separate the grain, breaking it open. Finer grain is then further separated by sieves. Larger particles that don’t break down can be used to feed livestock.

Once grain is milled, it is then stored in different bins to be shipped to manufacturers or end users.
Key issues for process instrumentation

Siemens process instrumentation products for the grain industry are applicable primarily in storage, conditioning and movement of raw and finished product, as well as process protection for equipment and weighing of bulk material.

Our portfolio of products offers a full range of answers to the industry trends in safety, automation, and inventory management.

Safety

• In solids level measurement – eliminating the need for constant human measurement from the top of silos by providing accurate level indication to operators on the ground.

• In process weighing – ensuring materials are flowing in the correct direction and that the right amount is being transferred to eliminate manual intervention.

• In continuous gas analysis – detecting smoldering fires in the exhausted air of wheat dry mills.

Automation

• In material flow – making sure resources are being effectively used and that truck or rail load-outs are close to target, saving on over or under loading transport.

• In process protection – determining when filters break or are too dirty, and when dust collection systems are compromised by material flow into air ducts.

Inventory management

• In level measurement – balancing and checking stock of raw materials to ensure reliable amounts of processing ingredients are present.

• In material flow – knowing that full utilization of stocking and transportation is standard operation to prevent wasted time and resources.
Level applications

Measuring the level of grain has traditionally been problematic for both contacting and non-contacting measurement technologies. Contact technologies are not ideal because of the highly abrasive nature of grain. Non-contacting technologies can have problems with the amount of dust created by grain in motion and with their installation in tall, narrow vessels with complex geometry and internal obstructions. The results can be an increased replacement frequency or costly measurement errors in the silo.

SITRANS LR560

- 78 GHz radar transmitter allows for measurement through dust within enclosed silos
- An exceptionally narrow 4-degree beam angle can cope with complicated silo geometry
- Sealed lens cavity is highly resistant to dust buildup
- Easy to install and configure with Quick Start Wizard
- Small size fits most silo nozzles
- Two measurement ranges: 40 m (131 ft) and 100 m (328 ft)

SITRANS LR560 (A) has a narrow beam when compared to other typical transmitters (B). TDR (C) signal is guided by a cable for specific measurements where the material touches the cable.
SITRANS LR560

SITRANS LR560, the world’s first radar solids level measurement transmitter operating at 78 GHz, takes on grain industry challenges easily and effectively. Even extreme dust is no problem. SITRANS LR560’s narrow 4-degree beam angle means that readings in a grain silo’s cone area are now possible in a non-contacting environment.

Shipper bin

When loading rail cars, trucks, or barges, the shipper bin acts as a buffer to allow for starts and stops during filling. With grain levels constantly changing, dust is a major issue and a difficult measurement.

Inventory monitoring

Maintaining accurate inventory is required to control inventory costs and ensure appropriate amounts of stock are available. The first step in automating a facility’s manual processes, level measurement helps to improve safety by reducing the frequency of workers’ trips to the tops of silos.

Curing headaches in malted barley measurement

A Canadian manufacturer of malted barley, wheat, oats, and rice extracts was seeking an improvement over their outdated measuring techniques in malted barley silos. Grain extracts can be used in everything from cereal, bread, biscuits, and pastries to chocolate, pet food, vinegar, chewing gum, ice cream, and, of course, beer.

For years, the company had been using a weight and cable level measurement system to measure malted barley in two outdoor silos, but these resulted in ongoing maintenance and reliability issues. With malted barley grain arriving by rail car or truck every few days, grain delivery was always a control headache, as a silo’s capacity is much less than that of a rail car. With the variable delivery schedules and the expense of rail car unloading demurrage time, it is crucial to have constantly accurate inventory level measurement. Precise inventory monitoring ensures that unloading from rail cars or trucks takes place within the allotted days and without exceeding the silos’ capacity, since cleanup of spilled grain is not easy.

The decision was to select the new SITRANS LR560 to provide a level measurement solution. The stainless steel housing was readily adaptable to the company’s preferred way of installation on the silo inspection hatch, and its compact size made it easy to carry the transmitter to the top of the silo for the installation. The transmitter’s 2-wire configuration was also instrumental in saving installation work and wiring costs. The seams of the inside of the silo did not interfere with the level readings, and reliable readings are provided all the way to the bottom of the cone area.

Since the new SITRANS LR560 has been installed, operators have noticed very stable readings from the transmitter, from completely empty to full. During filling, operators simply keep an eye on the remote display, monitor the filling cycle, and then shut the transfer system off if the level approaches the top of the silo. There has been zero maintenance on the SITRANS LR560 since its installation and no maintenance is expected.

The company is very happy with its decision. Operators know what is going on throughout the plant’s process, and they no longer have any overfilled silos or inaccurate readings from old technology.
Level

Ultrasonic instruments are a cost-effective choice for monitoring and control in short- to medium-range solids or liquids applications. The world leader in ultrasonic level technology, Siemens has many ultrasonic models available, combined with strong application experience to support the grain industry’s needs. Last but not least in the world of level measurement, point level technologies are ideal to indicate high or low levels for backup to a continuous measuring system.

To optimize inventory at production plants and distribution centers, Siemens level measurement product lines provide facilities with a system that is easy to integrate and use. Many steps related to inventory monitoring in the grain industry can benefit from this array of products. From simple monitoring to complete plant integration, Siemens level measurement solutions will suit your particular needs.

For example, a level measurement system for monitoring inventory amounts could consist of a Siemens MultiRanger 100 controller – or SITRANS LU10, for multiple silo installations – along with an Echomax XPS-15 transducer, and SITRANS RD500. This solution provides both local and internet-based remote monitoring for applications.

Siemens also offers an integrated range of products and communications options, including Wireless HART network solutions, as part of Totally Integrated Automation (TIA). With TIA, Siemens can provide an automation platform for the entire grain handling, milling, and storing life cycle.

MultiRanger 100/200 controllers

- Translate Echomax signals into level and volume readings
- Versatile short- to medium-range ultrasonic single- and multi-vessel level controllers
- 0.3 to 15 meters (1 to 50 ft), transducer and material dependent

SITRANS LU01/02/10

- Cost-effective level monitoring system with a range of models offering up to ten ultrasonic measuring points
- Coupled with appropriate Echomax transducers, SITRANS LU is ideal for measuring multiple vessels or silos

Echomax transducer

- From the top of a silo, the Echomax transducer measures levels of stock using ultrasonic technology, sending and collecting high frequency sound pulses continuously
- Resistant to a number of substances including steam, corrosive chemicals, and methane
- Non-contacting with an active face to ensure no material buildup

SITRANS RD500 remote data manager

- Provides remote monitoring through data logging, web access, and instrumentation alarming
- Using GSM or Ethernet communications options, SITRANS RD500 sends data to any remote location
- Enables remote monitoring of inventory levels, process and environmental applications, and provides web access to most types of field instrumentation
A Siemens client who manages most of several European countries’ bulk distribution for an animal feed manufacturer was searching to optimize feed stock inventory at the production plant and distribution centers.

The remote monitoring component of the company’s silo-content measurement system was developed together with a Siemens process instrumentation team using the SITRANS RD500 remote data manager connected to an ultrasonic level measurement system. The level measurement system consists of a Siemens MultiRanger 100 controller and an Echomax XPS-15 transducer.

The Echomax transducer on top of the silo measures the level of stock using ultrasonic technology, sending and collecting high frequency sound pulses continuously. The MultiRanger translates the signals into level and volume measurement. Using wireless (cellular) communications, the SITRANS RD500 sends the data to the logistics center, which dispatches the information to the transportation carrier and the feed supplier. Orders can be placed automatically, and transport planned efficiently through the route planning system.

Farmers now always know the current inventory of feed, independent from the location. They can order in a timely manner, with order errors reduced to a minimum. Because of this, cost reductions are substantial, and a mileage reduction of 10% creates a significant decrease in fuel costs and in CO2 emissions.

Overfill protection and inventory management

Providing switch points triggered by material contact, point level devices are used in a number of locations throughout the grain industry. To avoid overfills of bins and silos, install point level switches at the top of containers. Switches placed at low and mid-levels assist with inventory management through set markers indicating usage trends or fill times. Siemens has a full portfolio of level switches for both solids and liquids applications in the grain industry.

**Pointek CLS100/200/300/500**
- Provide accurate, repeatable point level switch performance for a large range of solids and liquid applications

**SITRANS LPS200 rotary paddle switch**
- Detects solids with densities as low as 15 g/l (0.94 lb/ft³), such as those found in grains. Ideal for applications with tendencies for buildup

**SITRANS LVL100 and LVL200**
- Vibrating liquid level switches ideal for high, low, and demand level alarms and pump protection

**LVS100 and LVS200 vibrating switches**
- Detect solids with densities as low as 5 g/l (0.3 lb/ft³), such as flour and light dusty powders
Flow applications

Grain handling and blending raw materials – often with additives – are flow applications common to many grain facilities. All of these activities require highly accurate flow measurement for both quality assurance and product consistency. Precise measurement is also essential to ensure compliance with environmental regulations and food safety standards.

Temper bin – water additive

After the first cleaning phase, wheat kernels are conditioned with water and allowed to rest in temper bins to toughen the bran coats of the wheat kernels and soften or mellow the endosperm. Tempering is one of the most important stages in the milling process, and great care is taken to condition the kernels appropriately prior to milling. SITRANS F M MAG 5100 W monitors water usage so operators can adjust additive water accurately.

SITRANS F M MAG 5100 W

- Coned design achieves increased low-flow accuracy, making it especially useful for leak detection
- Optimizes management and process control
- Ensures correct dosing and product quality
- No moving parts ensures long-term performance

Raw materials handling and blending

Maintaining accurate inventory is required to control costs. To track inventory accurately, the customer measures the grain as it is put into storage silos. Certain mills often blend various wheat varieties to produce branded products. Continuous flow metering with SITRANS WF100 series flowmeters, along with Siemens Milltronics SF500 flowmeter integrators, improves quality and reduces process inefficiencies such as material costs and time loss.

SITRANS WF100 series flowmeter

- High accuracy for monitoring a wide range of grain product ingredients and animal feed blending
- Compact, reliable solution for applications with limited installation space
- Stainless steel option meets USDA and FDA requirements for food processing
On track with Siemens flowmeters

As part of a facility upgrade, a North American grain elevator operator was looking to move from manual rail car load-outs to a more precise, automated system. For years, an employee was stationed above the rail car and used a dipstick to gauge when grain had reached the appropriate level. Measurements were not always accurate, and the facility owner found that inefficiencies were a regular occurrence. Overfilled rail cars are subject to enormous fines, while shipments with less grain than the amount ordered by a customer can cause problems as well.

The solution was to install SITRANS WF300 series flowmeters to measure the amount of grain being loaded into rail cars. Flowmeters are installed in gravity fed processes, measuring only the horizontal force component of dry solids material flow striking the sensing plate. The flowmeters respond to the force of the material striking the plate for consistently precise measurements. Material buildup does not affect performance as the plate only reacts to horizontal forces of impact.

The new flowmeters have automated the load-out process, allowing the operator to optimize rail car filling. Load-outs are now precisely measured so that shipments are not too full or too light, satisfying both the operator and customers.

Truck and rail load-out

When loading trucks it is important to load as close to the target weight as possible. If the truck is too heavy, material must be removed. If the truck is not loaded enough, the truck must ship without a full load or return to the loading area. SITRANS WF300 flowmeter, in combination with Siemens Milltronics SF500 flowmeter integrator, ensures that trucks receive the correct amount of grain.

Siemens Milltronics SF500 flowmeter integrator

- For use with solids flowmeters, signaling for accurate flow rate and totalized weight of bulk solids
- Can take on lower level control functions traditionally handled by other devices, and it supports popular industrial communication buses
- May be used for ratio blending and controlling additives while operating in tandem with two or more solids flowmeters or weighfeeders
- Also provides batching, load-out, and alarm functions
A seasoning company in Europe was modernizing its weighing and dosing units for improved customized seasoning blending. After careful evaluation, the company decided in favor of Siemens SIWAREX FTA (Flexible Technology Automatic weighing instrument) weighing assembly.

SIWAREX FTA is a versatile and flexible weighing module for industrial use. It can be applied for automatic and non-automatic weighing, such as the production of mixtures, filling, loading, monitoring and bagging. It has been assigned appropriate scale approvals and is suitable for legal trade (OIML R51, R61, R76, R107). SIWAREX FTA is the ideal solution for applications that demand a high degree of accuracy and speed: it will measure at speeds of 100 measurements per second, with a resolution of 16 million increments in up to three ranges. The device comes already calibrated, which means there is no need for recalibration after components are exchanged.

The seasoning company’s experience with SIWAREX FTA has been very positive. Some of the benefits include the high performance of all typically-needed weighing modes, so no separate and costly options were required. As well, the company has enjoyed this individual, customized design.
Weighing applications

Weighing is of significant importance to the grain industry. From keeping accurate grain inventory to the shipping process, operators require precision. Processes are increasingly becoming more automated to ensure compliance with the strict quality regulations of a very competitive market.

Conveyor loading
Handling grain throughout processing and shipping operations demands both speed and precise measurement. When conveyors are loaded with grain to be processed, belt scales ensure that accuracy is met at every step of the process. As well, grain facility operators use belt scales in conveyor systems to load grain from barges to storage, rail, or trucks.

Legal-for-trade
Legal-for-trade scales are used when grain products are sold by weight. Measuring equipment needs approvals and routine inspections to guarantee that amounts are within the strict accuracy figures required for trade. Belt scale measurements therefore must be exact yet also user-friendly so that operators can smoothly perform calibrations. Milltronics MSI belt scales meet these requirements.

**Milltronics MSI belt scale**
- Heavy-duty, high accuracy, used for process and load-out control
- Continuous in-line weighing on a variety of products in primary and secondary industries including use in legal-for-trade processes
- Patented parallelogram-style load cells result in fast reaction to vertical forces, ensuring instant response to product loading
- Outstanding accuracy and repeatability, even with uneven loading and fast belt speeds
- Minimum maintenance with only periodic calibration checks required

**Milltronics BW500 integrator**
- For use with both belt scales and weighfeeders
- Operates with a belt scale and a speed sensor. Belt load and speed signals are processed for accurate flow rate and totalized weight of bulk solids
- Can take on lower level control functions traditionally handled by other devices, and supports popular industrial communication buses

Bagging
One method of transporting and storing grain is by placing it in polyethylene bags. These bags are airtight and a cost-effective way of ensuring that grain is measured properly. Efficient bagging processes will fit seamlessly into automated systems. SIWAREX load cells are known for their high accuracy, and work extremely well in bagging activities.

**SIWAREX WL230 shear beam load cell and FTA module**
- Extremely compact especially useful in crowded conditions
- Ideal for use in large-sized platform scales, batching systems, sacking systems, or bin scales
- Use in legal-for-trade scales is possible with SIWAREX WL230’s accuracy class
- Easy and quick installation with SIWAREX mounting units
Process protection

One significant piece of increasing safety in a grain operation is reliable process protection. Siemens sensors and alarms help detect system blockages and ensure that operations are working properly, helping operators identify breakdowns or failures. Process protection devices will quickly alert you of equipment malfunctions and process slowdowns so that you can immediately take action.

Bucket elevator slip detection

One concern of grain elevator operators is bucket elevator belt slippage. Measurement is needed to prevent damage to the belt due to heat buildup and the possibility of explosion. Siemens motion control products measure the number of buckets passing the probe over time. When a slowdown is detected, alarms are provided, and if the slowdown continues, the elevator is shut down. With sensing ranges of up to 100 mm (4") and rugged industrial design, these motion probes are proven to endure the abuse of industrial applications.

Milltronics MFA motion failure alarm controller and MSP probes

- Highly sensitive, used with Milltronics MSP and XPP probes
- Detects changes in the motion and speed of rotating, reciprocating or conveying equipment. Warns of equipment malfunction and signals through contacts to shut down machinery in case of a slowdown or failure
- Suits most industrial applications, and can be used on tail pulley shafts, driven pulleys, motor shaft sensing, belt or drag conveyors, screw conveyor flights, bucket elevators, fans, and pumps
- Adjustable 0 to 60 second time delay allows the monitored device to accelerate to normal running speed before monitoring begins

SITRANS WM100 alarm switch

- Heavy-duty, providing cost-effective equipment protection even in the harshest conditions
- Impervious to dust, dirt, buildup, and moisture and is ideal for such harsh industries as mining, aggregate, and cement
- Non-contacting design eliminates the need for lubricating, cleaning, and part replacement
- Reduces downtime and cleanup expenses associated with conveying equipment failure. It alarms to minimize spillage, prevent extensive damage or even fire caused by belt slippage at the head pulley, and warns against conveyor malfunction
- Built-in selectable start delays and 1 Form C relay contact. With an aluminum body, it operates from -40 to 60 °C (-40 to 140 °F)

Route verification

When receiving various types of grains, there are dedicated bins for each type. Material can accidently route to the wrong bin due to a failed diverter valve. This leads to cross grain contamination, and results in scrapped raw material. The SITRANS AS100 is installed externally to duct work or pipes and will indicate material flow presence to confirm routing to the appropriate silo.

Air filtration

Filtration in grain facilities is essential for maintaining a safe environment for workers. Also, clean filters ensure that enough airflow is present to keep grain moving smoothly through the handling and milling process. The SITRANS AS100 will alarm if filters become torn or inefficient and allow exhaust dust particles.
Safety application

Chlorine gas is added as a disinfectant to finished flour. As long as flour is moving down the chute, chlorine gas is injected and mixed with flour safely. Once a blockage occurs, chlorine gas builds up in an empty chute creating an unsafe condition. SITRANS CU02, working with SITRANS AS100, detects the blockage and determines when it is safe to add chlorine gas.

**SITRANS AS100 acoustic sensor**

- Used for solids flow detection, detecting changes in high-frequency sound waves from equipment and materials in motion
- Detects and reacts instantly to changes in solids flow to warn of blockages, product absence, or equipment failure such as burst filter bags
- Common applications include pellets, powders, and most bulk solids in pipes, chutes, vibratory feeders, pneumatic conveyors, or aerated gravity flow systems
- Operating with a SITRANS CU02 control unit, the system detects conditions of high flow, low flow or no flow

**SITRANS CU02 alarm control unit**

- Readily configured for set points indicating such conditions as high flow, low flow or no flow
- Two fully programmable relays to operate an alarm or control device. Readings are also displayed locally by the SITRANS CU02 on its LCD
- May be mounted up to 500 meters (1500 ft) from the sensor
- Receives a 0 to 10 V DC input signal from the SITRANS AS100 sensor, providing relay and analog outputs for interface into a process
Continuous process gas analytics

Keeping you and your employees safe, Siemens provides the ideal gas analyzer for any grain application. Our portfolio of gas analyzers can measure concentrations of combustible gases in grain silos, or track grain spoilage by measuring CO₂ levels in grain elevators.

Wheat dry mills

Fast detection of any kind of smoldering fire in wheat dry mills is essential to ensure safety in your facility. By measuring amounts of carbon monoxide traces (range 0 to 10 ppm) in the wheat dry mill’s exhausted air, gas analyzers quickly and accurately detect any smoldering fires that may occur. The main cause of smoldering fires is sparking from the mechanical friction of the rotating roller mills. This typically occurs at the final process stage if there is interrupted flour flow into the roller mill where the finest wheat flour is pulverized.

Spoilage detection

Currently many facilities measure grain spoilage using temperature probes, since as the grain begins to rot, the temperature will rise. Grain elevators have multiple temperature probes at different levels looking for hot spots. Interestingly, prior to these temperature increases, the grain emits CO₂ gas. Measuring CO₂ levels with Siemens Ultramat 23 can provide earlier detection than measuring for rising temperatures.

Ultramat 23

- With its multi-component design with NDIR technology for the measurement of up to three IR active constituents, the Ultramat 23 is extremely economical.
- The integrated automatic calibration function using ambient air is a unique advantage. Calibration check is only necessary once a year.
- Menu-guided operation with plain text allows users and service personnel to operate the device immediately.
- Multi-layer detectors guarantee high selectivity and reduced water vapor interference. Measuring cells are robust and resistant and can easily be cleaned in case of faults pollution, induced by errors in the sample preparation leading to soiling. Sample cell is robust and can be easily cleaned.

“Safety doesn’t happen by accident.”
-- Anonymous
Process instrumentation and analytics product range

Siemens offers the most comprehensive product range for the grain industry and has a solution for even the most difficult measurements.

## Continuous level measurement

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<th>Radar</th>
<th>Ultrasonic</th>
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<td><img src="image2" alt="Ultrasonic Devices" /></td>
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### Liquids level measurement
- SITRANS LR200 and SITRANS LR250 offer continuous monitoring of liquids and slurries in storage/process vessels.

### Solids level measurement
- SITRANS LR460 and SITRANS LR560 offer continuous monitoring of solids in a variety of silos or storage bins.

### SITRANS LG200
- 2-wire, guided wave radar transmitter for short- to medium-range level, level/interface, and volume measurement of liquids and solids.

### SITRANS Probe LU
- 2-wire, loop powered ultrasonic transmitter for level, volume, and flow monitoring of liquids in storage vessels, simple process vessels, and open channels.

### Level controllers and transducers
- SITRANS LU01/LU02/LU10 and MultiRanger 100/200 can be used in a variety of applications in combination with Echomax transducers.

## Flow measurement

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<th>SITRANS solids flowmeters</th>
<th>Milltronics belt scales</th>
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<td><img src="image4" alt="SITRANS Solids Flowmeters" /></td>
<td><img src="image5" alt="Milltronics Belt Scales" /></td>
<td><img src="image6" alt="SITRANS Weighfeeders" /></td>
<td><img src="image7" alt="SIWAREX PLC Based Weighing Systems" /></td>
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### Electromagnetic flowmeters
- Siemens full series of flowmeters for liquids and slurries gives a wide range of customer-specified process connections.

### SITRANS solids flowmeters
- Accurate measurement and control of flow rates of product so that quality and plant efficiency are consistently maintained. Dust-tight, ensuring a healthier work environment, especially during hazardous substance monitoring.

### Milltronics belt scales
- Heavy-duty, high accuracy single idler belt scales used for process and load-out control. Milltronics belt scales provide continuous in-line weighing for monitoring such products as flour, grain, or sugar.

### SITRANS weighfeeders
- Control and monitor feed rates and blending in cereals, seeds or minerals; easy belt removal for replacement or cleaning. Fast installation, easy to clean and maintain.

### SIWAREX PLC based weighing systems
- Provide optimum integration into the automation structure of the process. Ideal for users familiar with the SIMATIC PCS 7 process control system and components.
## Continuous level measurement

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<th>Point level</th>
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<tr>
<td><strong>Point level switches</strong>&lt;br&gt;Pointek CLS and ULS200, SITRANS LPS200, SITRANS LVL100/200, SITRANS LVL100/200, and Milltronics tilt switches offer a range of level detection options for liquids and solids applications.</td>
<td><strong>SITRANS RD100/200/500</strong>&lt;br&gt;SITRANS RD100/200 are remote displays for process instrumentation. SITRANS RD500 provides integrated web access, alarm event handling, and data capture.</td>
<td><strong>Ulramat 23</strong>&lt;br&gt;The ULTRAMAT 23 is a continuous gas analyzer designed for emission monitoring applications. The integrated automatic calibration function using ambient air is a unique advantage.</td>
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## Process protection

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<th>Speed sensors</th>
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<th>Motion sensors</th>
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<td>Speed sensors operate in conjunction with a conveyor belt scale, providing a signal to an integrator (Milltronics BW100 or BW500, or SIWAREX FTC module), which computes the rate of material being conveyed.</td>
<td>Milltronics BW100, BW500, and BW500IL integrators work with single or dual strain gauge load cell-based belt scales. Milltronics SF500 operates with any solids flowmeter with up to two strain gauge load cells or LVDT sensor.</td>
<td>Most MFA 4p motion sensing probes as well as the Millpulse 600 can be mounted up to 100 mm (4&quot;) from the ferrous target, reducing the chance of damage to the probe and the equipment. SITRANS WM100 zero-speed alarm switch provides equipment protection even in harsh conditions.</td>
<td>SITRANS AS100 detects changes in high-frequency sound waves resulting from particle impacts on equipment. In combination with SITRANS CU02 alarm control unit, it detects and reacts instantly to changes in solids flow.</td>
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Industrial communication

Industrial communication is key to realizing a demand-driven supply chain, optimized maintenance cycles, and increased efficiency, especially in hybrid processes. Through bundling different solutions with SIMATIC NET, Siemens meets customer requirements in an optimal fashion. SIMATIC NET is a component of Totally Integrated Automation, the integrated range of Siemens products and systems for automation.

Sensors represent the sense organs for machines and systems that run automated production processes. The importance of sensor technology grows steadily as production processes become increasingly complex and process safety requirements continue to multiply.

All the machines in your facility must work in an integrated manner in order for you to increase efficiency. This requires open, integrated communication linking your automation systems through the company and beyond. Siemens technology helps you to harness the power of automation and Information Technology through:

- Seamless flow of information from the sensor/actuator level to company ERP systems
- Availability of information in any place
- Fast data exchange between plant sections
- Easy, integrated configuration and efficient diagnostics
- Integrated security functions that block unauthorized access
- Fail-safe and standard communication in one cable
- Wireless solutions specially developed for industrial needs

Our range

Communication networks are of utmost importance for automation solutions. SIMATIC NET – Networking for industry – offers a wide selection of modular blocks designed for industry, which help to solve your communication tasks efficiently.

Industrial communication – designed for industry

IO-Link – The standard for intelligently connecting sensors and actuators from the field to the MES level. AS-Interface connects sensors and actuators by means of a two-wire cable and represents a low-cost alternative to cable harnesses. PROFIBUS is the international standard for the field level, and Industrial Ethernet the international standard for area networking. PROFINET, the international standard based on Industrial Ethernet, permits real-time communication all the way down to the field level and can even cover the enterprise level. Industrial Wireless Communication stands for the flexible use of industrial communications products.

Decentralization has been gaining worldwide importance for a number of years now. The distributed plant structure can reduce installation, maintenance, and diagnostics costs. This involves intelligent devices working locally and being connected together across networks.
Predictive maintenance
Cost savings are achieved through the realization of predictive maintenance systems. Combining intelligent field devices with SIMATIC NET architecture enables considerable cost savings through reduced installation efforts, predictive maintenance, and intelligent diagnostics. Siemens offers a wide range of Industrial Communication components specifically designed for reliable use in different industries.

Wirelessly networked
Thanks to the use of mobile devices linked via wireless data networks (e.g. Industrial Wireless LAN), the efficiency of processes can be significantly improved. The main advantage of industrial wireless solutions is the easy and flexible availability of mobile stations or stations that are difficult to access. Greater flexibility is achieved by means of wireless communication to controllers and industrial terminals. Maintenance work is simplified, service costs and downtimes are reduced, and personnel are optimally utilized.

With safety, even fail-safe communication is possible via a wireless network. This makes a company considerably more competitive. Demanding applications, such as those with deterministic or real-time requirements, can now be used for radio technology. The use of radio on moving machines saves cabling materials and maintenance costs, automated guided vehicle systems can obtain data without the need for cables, and the choice of route is not restricted.
Industrial identification

Identification systems assist companies in keeping their positions in ever more dynamic markets: automatic data acquisition via RFID or 1D and 2D codes will help you meet the continuously growing demands made on control of production and material flows, asset management, tracking and tracing, as well as supply chain management. Siemens provides the key technology for this purpose.

As the global market leader for identification systems with more than 25 years of experience and industry expertise in the field, Siemens offers a comprehensive range of RFID systems and code reading systems from one supplier. With Siemens by your side, you will opt for simple system integration in the automation and IT level as well as application consulting independent of the application.

Radio frequency identification and code reading systems

The right solution for every identification job from just-in-sequence production to safe and complete traceability of products or batches: machine-readable and automated, contactless identification systems are used in the intelligent material flow and production control. Data Matrix Codes (DMC) or Radio Frequency Identification (RFID) convince with their high level of data security and have proven themselves in many applications – even in rough industrial environments. They offer a serious reduction in time and effort when compared to manual identification and acquisition techniques.

Main criteria for the selection of matching storage and identification technologies:

- Is the data carrier returned to production (closed loop) or does it exit production with the product at the end of the processing chain (open loop)
- Single or repeated identification/labeling within the processing chain
- Detection distance/ranges and lighting conditions/contrast
- Consistency of the products to be labeled as well as the space available to place a label
- Potential sources of problems, such as ambient temperature and dirt

Vision Sensors

Application-specific machine vision tasks – such as the automatic parts recognition by means of shapes, dimensions, samples, outlines, or colors – can be optimally solved with our vision sensors. In addition, the easy control concept and the simple teaching-in of the inspection tasks will convince you.
Control, visualization and operation level

- PROFINET
- PROFIBUS

Sensor level
- MV440
- RF380R
- VS130-2
- RF340 R

SIMATIC HMI
Integrated solutions

Siemens has the most comprehensive product range on the market for the grain industry. Ranging from drives, motors, and switchgear, process instrumentation and analytics, the product range also includes power management systems, industrial communications networks, and building management technologies.

Innovations for more productivity
With Totally Integrated Automation (TIA), we offer you an automation platform for process and manufacturing automation that is still unique in the world. As in the flow of information, each step in production can be integrated system-wide, from the field level right up to the corporate management level. This promises more cost-effective engineering and efficiency as well as increased profitability across all processes.

Totally Integrated Automation
• Reduces the number of interfaces
• Ensures maximum data transparency
• Covers all levels of your operations
Services and support

Siemens offers field-proven concepts for process instrumentation and analytics from a single source, providing you with development continuity and a high level of security.

Our services range from consulting and engineering, connection to the control system, and comprehensive after-sales services:

- System and schedule planning
- Complete design planning and engineering of field devices
- Consultation on the selection of process instruments and analytics
- System documentation
- Installation, testing, and commissioning
- Comprehensive after-sales service

Service around the world

Plants must function reliably around the clock. Efficient and effective process instrumentation and analytics are an indispensable prerequisite to this end. You also need to be certain of fast and competent service from your supplier. Siemens is a global company that reacts locally. Whether you require consulting, quick delivery or installation of new devices, the Siemens network of specialists is available to you around the world, whatever your location.

Service around the clock

Our online support system offers rapid, comprehensive assistance regardless of time or location. From product support to service information, Siemens Industry Automation and Drive Technologies online support is your first choice – around the clock, 365 days a year.

www.siemens.com/automation/service&support
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